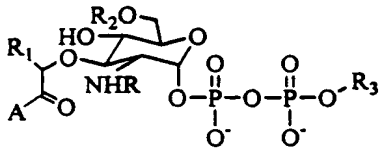
What Is Claimed Is:

1. A substance comprising the chemical moiety of the formula:



(I)

in which "R" is an acyl group comprising 2 or more carbon atoms, "R_1" is a substituted or unsubstituted alkyl group comprising 1 or more carbon atoms, "R_2" is a hydrogen or a substituted or unsubstituted alkyl group comprising 1 or more carbon atoms, "A" is a substituted or unsubstituted amino acid residue or a peptide comprising 2 or more substituted or unsubstituted amino acid residues, "R_3" is a substituted or unsubstituted alkyl group comprising 5 or more carbon atoms, said substance exhibiting a binding affinity for at least wild type MurG enzyme and provided that said substance is not Lipid I, the natural substrate of wild type MurG enzyme.

2. The substance of claim 1 which serves as an acceptor for the GlcNAc transferase activity of at least wild type MurG enzyme.

3. The substance of claim 1 which inhibits the GlcNAc transferase activity of at least wild type MurG enzyme or its homologs.

4. The substance of claim 1 in which "R" is an acetyl group.

5. The substance of claim 1 in which "R_1" is a methyl group.

6. The substance of claim 1 in which "R_2" is a hydrogen.

7. The substance of claim 1 in which "R_3" is citronellol.

8. The substance of claim 1 in which "A" is a pentapeptide.

9. The substance of claim 8 in which the amino acid residue attached to the lactic acid moiety of the substance of the formula (I) is Ala.

10. The substance of claim 9 in which the amino acid residue attached to said Ala is Glu.

11. The substance of claim 10 in which the amino acid residue attached to said Glu is Lys.

12. The substance of claim 8 in which said pentapeptide has the sequence Ala-Glu-Lys-Ala-Ala, the amino terminal end of which is attached to the lactic acid moiety of the substance of the formula (I) via an amide bond.

13. The substance of claim 1 in which "A" is conjugated to a biotin moiety.

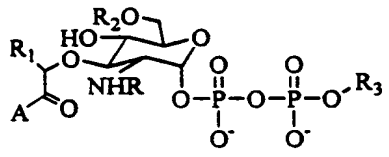
14. The substance of claim 13 in which said biotin moiety is attached covalently to an amino group of an amino acid residue either directly or via a linker moiety.

15. The substance of claim 1 in which "R_3" is bound to a solid support.

16. A method of detecting GlcNAc transferase activity in a sample suspected of containing a protein or an active fragment thereof exhibiting GlcNAc transferase activity comprising:

(a) providing a sample suspected of containing a protein or an active fragment thereof exhibiting GlcNAc transferase activity;

(b) contacting the sample with effective amounts of labeled UDP-GlcNAc substrate and a substance comprising the chemical moiety of the formula:



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under conditions effective to provide a labeled coupling product comprising labeled GlcNAc coupled to said substance via a glycosidic bond in the presence of a protein or an active fragment thereof exhibiting GlcNAc transferase activity;

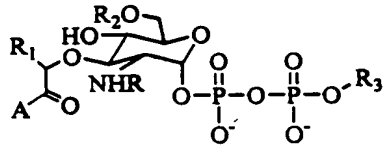
(c) detecting the formation or presence of said labeled coupling product, which is indicative of GlcNAc transferase activity in said sample.

17. The method of claim 16 in which said labeled GlcNAc substrate is labeled UDP-GlcNAc.

18. The method of claim 16 in which at least a portion of said sample comprises a portion of a lysed bacterial culture, a portion of a supernatant thereof, a portion of a membrane fraction thereof, a portion of a protein fraction thereof, a purified enzyme, purified or synthesized lipid or mixtures of same.

19. The method of claim 16 in which the detection step comprises separation of labeled coupling product from labeled UDP-GlcNAc substrate.

20. An assay for detecting GlcNAc transferase activity in a sample suspected of containing a protein or an active fragment thereof exhibiting GlcNAc transferase activity comprising a compound of the formula:



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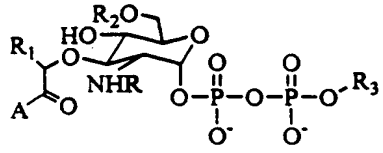
21. The assay of claim 20 which further comprises a labeled GlcNAc substrate.

22. A screen for compounds exhibiting potential antibacterial activity comprising (i) a protein or an active fragment thereof exhibiting GlcNAc transferase activity, (ii) a substance comprising the chemical moiety of the formula:



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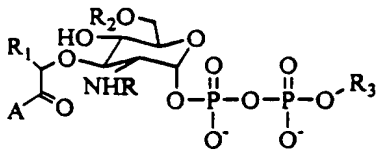
23. A substrate analog of Lipid I (i) having a structure that is accepted by at least wild type MurG enzyme such that a labeled coupling product is produced by the GlcNAc transferase activity of the enzyme in the presence of said substrate analog and labeled UDP-GlcNAc, and (ii) having structural features that facilitate the separation of labeled UDP-GlcNAc from said labeled coupling product.

24. A substance comprising the chemical moiety of the formula:



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25. The substance of claim 24 in which "A"or "R_3" is bound to a solid support.

26. The substance of claim 25 in which said solid support is an avidin or strepavidin coated resin and said "A" or "R_3" are conjugated to a biotin moiety.

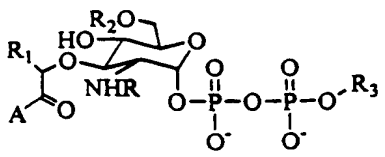
27. The substance of claim 26 in which said biotin moiety is attached to "A" or "R_3" either directly or via a linker moiety.

28. A pharmaceutical composition comprising the substance of claim 24 and a pharmaceutically acceptable carrier.

29. A method of detecting GlcNAc transferase activity in a sample suspected of containing a protein or an active fragment thereof exhibiting GlcNAc transferase activity comprising:

(a) providing a sample suspected of containing a protein or an active fragment thereof exhibiting GlcNAc transferase activity;

(b) contacting the sample with effective amounts of labeled UDP-GlcNAc substrate and a substance comprising the chemical moiety of the formula:



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(c) detecting the formation or presence of said labeled coupling product, which is indicative of GlcNAc transferase activity in said sample.

30. The method of claim 29 in which said labeled GlcNAc substrate is labeled UDP-GlcNAc.

31. The method of claim 30 in which at least a portion of said sample comprises a portion of a lysed bacterial culture, a portion of a supernatant thereof, a portion of a membrane fraction thereof, a portion of a protein fraction thereof, a purified enzyme, a soluble enzyme, purified or synthesized lipid or mixtures of same.

32. The method of claim 29 in which the detection step comprises separation of labeled coupling product from labeled UDP-GlcNAc substrate.

33. The method of claim 29 in which said detection step comprises binding said "A" or "R_3" to a solid support via a biotin tag, wherein said solid support includes an avidin or streptavidin coated resin.

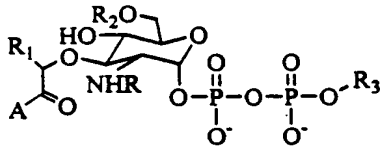
34. The method of claim 33 wherein said detection step provide a continuous monitoring of product formation via the use of scintillation proximity assay.

35. The method of claim 16 wherein said substance is a biotin-labeled substance and said separation involves filtration through an avidin-coated resin.

36. A method of identifying compounds with the ability to inhibit GlcNAc transferase activity comprising:

(a) providing a sample containing a protein or active fragment exhibiting GlcNAc transferase activity;

(b) contacting the sample with the potential inhibitor and effective amounts of labeled UDP-GlcNAc and a substance of formula:



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(c) detecting the formation or presence of coupled product and comparing the amount of product to that obtained in the absence of any potential inhibitor.